GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: *January 3, 1978*

Project Title: *Microearthquake Monitoring at B. Everett Jordan Lake, North Carolina*

Project No: *G-35-630*

Project Director: *Dr. L. T. Long*

Sponsor: *U.S. Army Engineer District, Wilmington, N.C. 28401*

Agreement Period: From *10/1/77* Until *9/30/78*

Type Agreement: *P.O. #DACW54-78-M-0925 (Fixed Price)*

Amount: *$6,339*

Reports Required: *Quarterly Letter Reports; Final (Annual) Report*

Sponsor Contact Person (s):

Technical Matters	Contractual Matters (thru OCA)
	Mr. F. L. Barnes, Contracting Officer *U.S. Army Engineer District, Wilmington-CE* *P.O. Box 1890* *Wilmington, N.C. 28401* *Phone: (919) 763-9971 Ext. 458/441* *(Mrs. Sidberry, Administrator)*

NOTE: FOLLOW-ON PROJECT TO G-35-620.

Defense Priority Rating: *none*

Assigned to: *Geophysical Sciences* (School/Laboratory)

COPIES TO:

- Project Director
- Division Chief (EES)
- School/Laboratory Director
- Dean/Director–EES
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- EES Information Office
- EES Reports & Procedures
- Project File (OCA)
- Project Code (GTRI)
- Other_____

CA–3 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: 1/24/79

Project Title: Microearthquake Monitoring at B. Everett Jordan Lake, NC

Project No: G-35-630

Project Director: Dr. L. T. Long

Sponsor: U. S. Army Engineer District, Wilmington, N.C. 28402

Effective Termination Date: 9/30/78 (P.O. Delivery date)

Clearance of Accounting Charges: N/A - Fixed Price Contract

Grant/Contract Closeout Actions Remaining: None

_ Final Invoice and Closing Documents
_ Final Fiscal Report
_ Final Report of Inventions
_ Govt. Property Inventory & Related Certificate
_ Classified Material Certificate
_ Other _____

NOTE: FOLLOW-ON PROJECT IS G-35-646.

Assigned to: Geophysical Sciences (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
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Office of Computing Services
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EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

CA–4 (3/76)

4-35-630

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF GEOPHYSICAL SCIENCES

Atlanta, Georgia 30332
(404) 894-2857

January 5, 1978

Mr. Barnes
U.S. Army Engineer District
Wilmington - CE
P.O. Box 890
Wilmington, N.C. 28401

Subject: Quarterly Letter Report ~~Number 5,~~ Covering Period of 1 October 1977 to 31 December 1977.

Reference: Contract No. DALW54-76-M-1970, Microearthquake Monitoring B. Everette Jordan Lake, N.C.

Dear Sirs:

The B. Everette Jordan seismograph has been in operation throughout this period except for seven weeks due to ink-pen problems at the project. We have requested that all ink reservoirs be cleaned and only new ink be used. New pens have also been ordered. If this does not improve the reliability of the writing system, we may have to recommend installation of a smoked paper system which although requires more work is more reliable.

During October, 378 hours of noise free recording were obtained out of a possible 744 hours for 50.81% coverage. For the same month there was 27 hours of noise for 3.63% noise. During November there was very poor coverage due to ink pen failures at the project. There were 52 hours of noise free recording out of a possible 744 for 7% coverage with 27 hours of noise for 2.69% noise. The month of December recorded 260 hours of noise free recording for 34.95% coverage with 131 hours noise for 17.6% noise.

An aftershock of the event near Franklinton was recorded on 1 October at 2:35:01 with S-P = 8.5 seconds.

The seismograph continues to record quarry explosions, including the Haygood, Knightdale, and Lamance quarries.

During the reporting period no natural events were identified as occurring within 15 Km of B. Everett Jordan Lake seismograph.

Respectfully submitted,

Leland T. Long
Associate Professor
Geophysics

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF GEOPHYSICAL SCIENCES

Atlanta, Georgia 30332
(404) 894-2857

May 3, 1978

Mr. Barnes
U.S. Army Engineer District
Wilmington - CE
P.O. Box 890
Wilmington, N.C. 28401

Subject: Quarterly Letter Report ~~Number 6,~~ 2 Covering
Period of January 1, 1978 - March 31, 1978

Reference: Contract No. DALW54-76-M-1970, Microearthquake
Monitoring B. Everette Jordan Lake, N.C.

Dear Sirs:

The B. Everette Jordan seismograph has been in operation for the three month period, except for approximately 3 weeks when there were ink pen problems at the project.

During January 107 hours of noise-free seismic records were obtained out of a possible 744 for 14% coverage. For the same month there were 135 hours of noise. In January from the first to the tenth and from the twenty-second to the thirtieth there were no records obtained due to the lack of a working pen at the project. During February, 571 hours of noise-free seismic records were obtained out of 672 for 85% coverage. There were 30 hours of noise in this period. During March, 360 hours of noise-free recording were obtained out of 744 hours for 48% coverage. There were 84 hours of noise. During this month from the 25th to the 31st there was no pen at the project.

The seismograph recorded a 2.5 magnitude event on February 25, 1978 with an origin time of 3:53:27.45 UT and location of 36:13^{o}N latitude and 79.42^{o}W longitude. This event occurred about 10 km north of Burlington, N.C. The S-P time was 7.8 seconds and the P arrival was not used due to the clock being out of synchronization with WWV. Also recorded were possible foreshocks and aftershocks on the 16th and 25th of February, 1978. The foreshock was recorded at 19:01:47.2 UT with a S-P of 7.8 seconds. The aftershock was recorded on February 25, 1978 at 16:59:55.7 UT with an S-P of 7.7 seconds. There was a possible event on February 17, 1978 at 5:04:12 of a magnitude of 0.95. The S-P time was 8.4 which corresponds to the S-P time of the September 30th event near Franklinton. However, we could not confirm the location of this event as being near Franklinton except for the similar S-P.

The following are the regional events picked up by BEJ during the period January 1, 1978 to March 31, 1978.

TABLE I

REGIONAL EVENTS

Date	P Arrival Time	S-P	Location
2-7-78	2:02:03	30.2	North of Columbia, South Carolina 34° 13'N 81° 15'W
2-22-78	12:14:07	32.4	
2-22-78	14:41:23	31.5	
2-24-78	7:34:51.5	29.8	
2-26-78	11:53:17.1	31.7	
2-26-78	18:18:31.9	32.2	
3-2-78	19:49:21.9	21.6	Possible events arriving from North
3-4-78	17:27:57.4	22.6	
3-17-78	18:27:8.5	23.4	

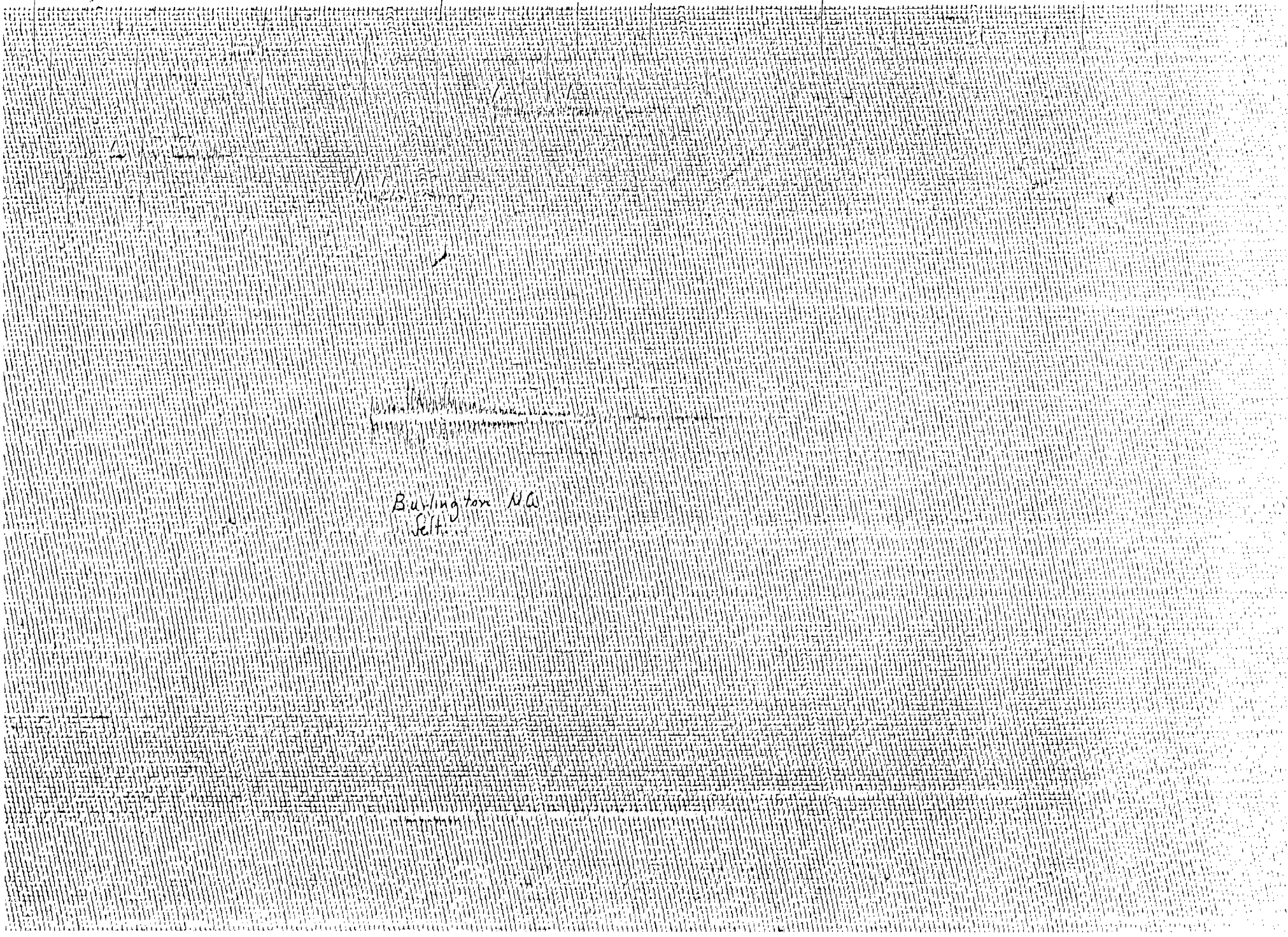
Also recorded were may quarry blasts in central North Carolina as well as mining activity in Eastern Kentucky.

During the reporting period no natural events were identified as occurring within 15 km of B. Everett Jordon Lake seismograph.

Respectfully submitted,

Leland Timothy Long
Associate Professor of Geophysics

LTL:nlg


Burlington NC
Salt

G-35-630

GEORGIA INSTITUTE OF TECHNOLOGY

SCHOOL OF GEOPHYSICAL SCIENCES

Atlanta, Georgia 30332
(404) 894-2857

October 31, 1978

Mr. R. L. Siesen
U. S. Army Corp. of Engineers
P. O. Box 1890
Wilmington, N. C. 28401

Subject: Quarterly Letter Report ~~No. 7~~ 3 - Covering period of 1 April 1978 - 30 June 1978

Re: Contract No. DACW54-76-M-0920, microearthquake monitoring, B. Everett Jordan Lake, N.C.

Dear Sirs:

The B. Everett Jordan seismograph has been in operation for the above mentioned three month period except for 2 1/2 weeks when there were ink pen problems at the project.

During April 375 hours of noise-free seismic data were obtained for 52% coverage. The same month recorded an additional 91 hours of noise which prevented interpretation of the records. During May 543 hours of noise-free seismic data were obtained for 73% coverage. The same month experienced 37 hours of noise which hindered interpretation of the records. During June 321 hours of noise-free seismic data were obtained.

The seismograph recorded several Bermuda events, an event from the north, and a South Carolina event.

Regional Events

Date	P-Arrival Time	S-P	Location
*These events should be added to final report.			
2 APR 1978	2:19:58.6	22.2	From the North
7 APR 1978	13:36:32.2	110.0	Bermuda Area
19 APR 1978	11:35:01.9	115.2	Bermuda Area
22 APR 1978	06:37:01	29.2	North of Columbia S.C. $34^{o}13'N$ $81^{o}15'W$
24 APR	05:47:32.5	115.2	
4 MAY 1978	05:47:32.1	110.0	Bermuda Area

Malfunctioning of preamplifier at the geophone and in the recorder caused unwanted instrument response which hampered any confident identification of events, especially in June.

The geophone continues to record quarry blasts from Lawbranch III, Haywood, Lawbranch I, Mt. Vernon Springs, McConnell, Ramseur, Hillsborough, Farrington (Inactive ?), Seaforth (Inactive ?), Garrboro and Knightdale.

During the reporting period no natural events were identified as occurring within 15 km of B. Everett Jordan Lake seismograph.

Sincerely,

Leland T. Long
Associate Professor

LTL/dp

G-35-630

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF GEOPHYSICAL SCIENCES
Atlanta, Georgia 30332
(404) 894-2857

October 25, 1978

Mr. R. L. Siesen
U. S. ARmy Corps. of Engineers
P. O. Box 1890
Wilmington, North Carolina 28401

Subject: Final Report covering the period of 1 October 1977 to 30 September 1978 - Contract No. DACW54-78-M-0925 Microearthquake monitoring, B. Everett Jordan Lake, N.C.

Dear Sirs:

The seismic station BEJ, was put into operation 16 November 1976. With the exception of short periods of data loss because of instrument malfunction, station BEJ has been recording seismic data continuously since that time. Station BEJ is located at the Resource Managers Office and Visitors Center near the B. Everett Jordan Dam. Corps of Engineers personnel are responsible for paper changing and routine maintenance. Georgia Tech personnel are responsible for minor repair and interpretation of the records. The first part of this report will provide data on coverage and data interpretations for data recorded from 1 July 1978 to 30 September 1978. The second part of this report will summarize the data analysis for the current contract period of 1 October 1977 to 30 September 1978.

Part 1. Data Coverage from 1 July 1978 to 30 September 1978

The B. Everett Jordan seismograph was operational for only three days during July and August, 1978 and for three weeks in September 1978. The time lost during the period was due to loss of the preamplifier at the geophone and in the recorder. The damage was probably caused by a lightning strike near the cable. A new preamplifier was designed for greater protection and the recorder preamplifier was repaired. On 7 September 1978 normal operation of the system was restored.

During July, 77 hours of noise-free seismic data were obtained out of a possible 744 for 10% coverage. The same month recorded an additional 3 hours of noise which prevented interpretation of the records. No data were obtained during August due to the failure of the system. During September, 549 hours of noise-free recording were obtained for 76% coverage of available time. Approximately 21 additional hours of noise were recorded which prevented interpretation of the records during the noise.

The station recorded several regional events including one near Charleston, South Carolina on 7 September 1977 with an origin time of 07:22:53.24 UT. A large earthquake south of Bermuda was recorded on 26 September with arrivals at 06:54:04.2 UT-(Pn), 06:54:08.9 UT-(P), 06:55:37.2 UT (Sn), and 06:55:58.1 UT (S). The origin time was about 06:52:19.7 UT. Possible microearthquake activity was observed on 11 September 1978 with an arrival time of 16:14:44.9 UT (P) and on 8.4 sec.

(S-P) time. This corresponds to the 8.4 sec. (S-P) time observed for the Franklinton, North Carolina events previously reported. A possible natural event was observed on 26 September 1978 with an arrival at 04:14:48.08 UT (P) and a 3.75 sec. (S-P) time. This would place the possible event at a distance of 34 km from BEJ station. Two other possible microearthquakes were observed on 27 September 1978 and 30 September 1978 with (S-P) times of 9.6 and 10.0 seconds respectively. Additional local information is needed to locate these events and confirm their identity as natural events.

Quarry blast's are continually recorded by the BEJ seismic station. Operating quarries from which blasting operations have been detected on the basis of distance and signal character include; Haygood, Mt. Vernin, Laubranch, McConnell (Inactive ?), Seaforth (Inactive ?) and Ferrington (Inactive ?).

No natural events were identified as occurring within 15 km of the BEJ seismic station on the data obtained during the reporting period.

Part 2. Summary of Coverage for total Contract period of 1 October 1977 to 30 September 1978

The records obtained during the annual contract period covered 40% of the available recording time. The data obtained contained many industrial explosions from distances of 30 to 150 km. Regional events (possible earthquakes or very large explosions) detected on the BEJ seismograms are listed in Table I.

TABLE I

Regional Events 1 October 1977 to 30 September 1978

Date	P Arrival (*) or Origin Time	S-P	Location
1 OCT 77	2:35:01*	8.5	Franklinton, N.C.
7 FEB 78	2:02:03*	30.2	North of Columbia, S.C.
16 FEB 78	19:01:47.2*	7.8	
17 FEB 78	05:04:12*	8.4	Franklinton, N.C.
22 FEB 78	12:14:07*	32.4	North of Columbia, S.C.
22 FEB 78	14:41:23*	31.5	South Carolina
24 FEB 78	7:34:51.5*	29.8	≃34°13'N81°15'W
25 FEB 78	3:53:27.45	7.8	Burlington, N.C. 36.13°N79.42°W
25 FEB 78	6:08:45.1	7.7	Aftershock of Burlington event
26 FEB 78	11:53:17.1*	31.7	North of Columbia, S.C.
26 FEB 78	18:18:31.9*	32.2	North of Columbia, S.C.
2 MAR 78	19:49:21.9*	21.6	Possible event
4 MAR 78	17:27:57.4*	22.6	from North of B. Everett
17 MAR 78	18:27:8.5*	23.4	Jordan
11 SEP 78	16:14:44.9*	8.4	Franklinton, N.C.
26 SEP 78	04:14:48.08*	3.75	Possible earthquake
27 SEP 78	01:07:45.5*	9.6	Possible earthquake
30 SEP 78	19:35:54.8	10.0	Possible earthquake

Locations given in Table I are based on distance from the BEJ station and data from other stations available in the southeastern United States.

Summary

Seismograms obtained from the BEJ seismic station have not shown evidence of seismic activity within a 15 km radius of the recording site during the monitoring period of October 1977 through September 1978.

Respectfully submitted,

Leland T. Long

LTL/dp